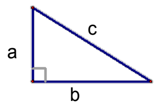
7.1 Apply the Pythagorean Theorem

Thm 7.1--The Pythagorean Theorem--In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs

$$c^2 = a^2 + b^2$$



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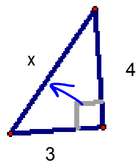


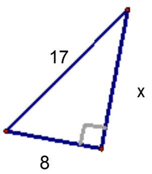
$x = 5$

$x^2 = 3^2 + 4^2$

$9 + 16$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$



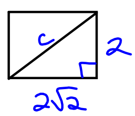
$17^2 = x^2 + 8^2$

$289 = x^2 + 64$

$225 = x^2$

$15 = x$

Find the diagonal of the rectangle with width of 2 and a length of $2\sqrt{2}$



$c^2 = 2^2 + (2\sqrt{2})^2$

$4 \cdot 2$

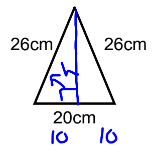
$4 + 8$

$c^2 = 12$

$c = 2\sqrt{3}$

Find the area of the isosceles triangle.

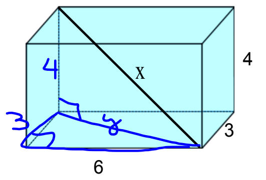
$A = \frac{1}{2}bh$



$26^2 = h^2 + 10^2$

$\underline{h = 24\text{cm}}$

$\underline{A = 240\text{cm}^2}$ $\frac{1}{2} 20 \cdot 24$



$y^2 = 3^2 + 6^2$
$9 + 36$
$y^2 = 45$

$x^2 = 4^2 + y^2$
$16 + 45$
$x^2 = 61$
$x = \sqrt{61}$

Pythagorean Triples

3 4 5	5 12 13	8 15 17	7 24 25
6 8 10			
9 12 15			
etc.			

7.2 Use the Converse of the Pythagorean Theorem

Theorem 7-2 The Converse of the Pythagorean Theorem--If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle.

$c^2 = a^2 + b^2$ Right

$c^2 > a^2 + b^2$ Obtuse

$c^2 < a^2 + b^2$ Acute

Examples   C is the largest.

3, 7, 8 $8^2 > 3^2 + 7^2$
obtuse $64 \qquad 9 + 49$

8, 16, 17 $17^2 < 8^2 + 16^2$
acute $289 \qquad 64 + 256$

$\sqrt{5}$ $\sqrt{20}$ 6 $6^2 > \sqrt{5}^2 + \sqrt{20}^2$
2.   4.
obtuse   36

The sides and classification of a triangle given below. The length of the longest side is the integer given. What value(s) of x make the triangle?

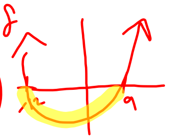
ex 1: x, x, 12; acute $\boxed{x > 6\sqrt{2}}$
or
~~$x < -6\sqrt{2}$~~

$12^2 < x^2 + x^2$
$144 < 2x^2$
$72 < x^2$
Solve using = $72 = x^2$
$\pm 6\sqrt{2} = x$

Restrictions
Is it a Δ? $2x > 12$
$x > 6$ ✓
Sides exist? $x > 0$

ex 2: 2x, 2x + 6, 30; obtuse

$30^2 > (2x)^2 + (2x+6)^2$
$(2x+6)(2x+6)$
$900 > 4x^2 + 4x^2 + 24x + 36$
$900 > 8x^2 + 24x + 36$
$0 > 8x^2 + 24x - 864$
$0 > x^2 + 3x - 108$
$0 > (x+12)(x-9)$



Change to = $x = -12 \qquad x = 9$
$-12 < x < 9$

Restr.
$2x + 2x + 6 > 30$ $2x > 0 \quad x > 0$
$x > 6$ $2x + 6 > 0$
$x > -3$

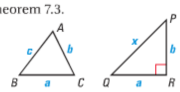
$\boxed{6 < x < 9}$

ex 3: x+2, x+4, $\sqrt{10}$; obtuse

40. **PROVING THEOREM 7.3** Copy and complete the proof of Theorem 7.3.

GIVEN ▶ In $\triangle ABC$, $c^2 < a^2 + b^2$ where c is the length of the longest side.

PROVE ▶ $\triangle ABC$ is an acute triangle.



Plan for Proof Draw right $\triangle PQR$ with side lengths a, b, and x, where $\angle R$ is a right angle and x is the length of the longest side. Compare lengths c and x.

STATEMENTS	REASONS
1. In $\triangle ABC$, $c^2 < a^2 + b^2$ where c is the length of the longest side. In $\triangle PQR$, $\angle R$ is a right angle.	1. ?
2. $a^2 + b^2 = x^2$	2. ?
3. $c^2 < x^2$	3. ?
4. $c < x$	4. A property of square roots
5. $m\angle R = 90°$	5. ?
6. $m\angle C < m\angle$?	6. Converse of the Hinge Theorem
7. $m\angle C < 90°$	7. ?
8. $\angle C$ is an acute angle.	8. ?
9. $\triangle ABC$ is an acute triangle.	9. ?

HW
p436-438 #s 3-5, 8,11-13, 24, 29
p444 #s 15-23 , 40